Federal Regulation of Certain Bulk Hazardous Cargo: Focus on the Great Lakes

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The federal acts and regulations with respect to vessels on the navigable waters of the United States are elaborate. They were well described . . . as a maze of regulation.

Charles Evans Hughes

INTRODUCTION

The "maze of regulation" that Chief Justice Hughes referred to has evolved into an intricate scheme for protecting the marine environment and for ensuring the safety and security of vessels and waterfront facilities. But it is still a maze, and probably a more mystifying one than ever before. An increase in the amount and variety of hazardous products transported has led to the promulgation of regulations designed to promote their safe movement. In theory, a regulation should exist to contain each hazard presented by a product. The practical difficulties of developing a compre-

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2. This Comment focuses on the transportation of hazardous cargo, excluding hazardous wastes, on the Great Lakes. Many regulations applicable to both Great Lakes and oceangoing vessels are discussed, but certain problems peculiar to ocean transportation are omitted. For example, the carriage of liquified natural gas (LNG) is not discussed. LNG is not, and probably will not, be transported on the Great Lakes. For discussion of the federal regulation of LNG, see Greenwald, LNG Carrier Safety: A Guide to the System of Federal Regulation, 9 J. MAR. L. & COM. 155 (1978).

Evidence comparing the Great Lakes with the oceans will not be presented, however: Lakeman!—Buffalol Pray, what is a Lakeman, and where is Buffalo?

On the eastern shore of our Lake Erie, . . . . For in their interflowing aggregate, those grand fresh-water seas of ours,—Erie, and Ontario, and Huron, and Superior, and Michigan,—possess an ocean-like expansiveness, with many of the ocean's noblest traits . . . .

hensive hazard regulation scheme are increased by the lack of manpower and expertise necessary for its development. But even if such a scheme were to be developed, there would still be insurmountable problems of enforcement and compliance. An all-inclusive regulatory system, given present institutional and technical limitations, is unattainable.

A system of regulations to contain those hazards that can be kept to a reasonably safe level must account for many variables. Pertinent considerations include the actual and purported hazards of the cargo; the threat posed to life, property, and the marine environment; the feasibility of the regulations in terms of manpower and technology; and the total cost of the system. Included in the total cost are the expense of promulgating and enforcing the regulation, borne by the government, and the expense of complying with the regulation, borne by the manufacturing and shipping industries. This Comment examines federal regulation of the transportation of bulk hazardous cargo (BHC) on the Great Lakes, in an effort to contribute to more comprehensive analyses of the problem of hazardous cargo transport.

I. BULK HAZARDOUS CARGO

A. Regulatory Procedures

The responsibility for regulating waterborne commerce is vested primarily in the United States Coast Guard, which has established rules, regulations, standards, and procedures ("marine

3. Although precise definitions vary, generally a bulk cargo is one that is not containerized and is shipped without count or mark. See, e.g., 46 C.F.R. § 448.01-1 (b) (1978); 49 Fed. Reg. 25,958, 25,960 (1978). See also Black's Law Dictionary 177 (5th ed. 1979) ("Bulk: Unbroken packages. Merchandise which is neither counted, weighed, nor measured.").

4. The terms "hazardous" and "dangerous" are used interchangeably throughout this article; neither is a term of art.

5. The United States Coast Guard was founded in 1790, but modern-day operations stem from the Act of January 28, 1915, ch. 20, 38 Stat. 800. The Act consolidated the Revenue-Cutter Service and the Life-Saving Service into the Coast Guard and established it as part of the Treasury Department. Under the Department of Transportation Act of 1966, 49 U.S.C. § 1651 (1976), it was transferred to the Department of Transportation. Recent legislation, such as the Ports and Waterways Safety Act of 1972, 33 U.S.C. §§ 1221-1227 (1976); Federal Boat Safety Act of 1971, 46 U.S.C. §§ 1451-1489 (1976); and The Water Quality Improvement Act of 1970, Pub. L. No. 91-224, 84 Stat. 91, has expanded the Coast Guard's safety and environmental duties and responsibilities. The agency's emphasis is now on the development of technical knowledge to implement new or revised standards for the design, construction, alteration, and repair of vessels and their equipment.
laws") to carry out its task. Its grant of jurisdiction includes all navigable inland and coastal waters within the territorial boundaries of the United States, and extends to all vessels navigating those waters.

The Coast Guard, in developing safety standards, derives information from scientific investigations conducted by its staff and by certain independent agencies commissioned to do research. Through its various divisions, the Coast Guard is responsible for safety and lifesaving equipment, safety standards in the construction of vessels, inspection requirements, recording of marine casualties, enforcement of maritime laws and treaties, and personnel qualifications.

The power of the Coast Guard to enforce these marine laws includes the authority to board a vessel for inspection. Authorized

6. 14 U.S.C.A. § 2 (Supp. 1979) states in part:
   The Coast Guard shall enforce or assist in the enforcement of all applicable Federal laws on and under the high seas and waters subject to the jurisdiction of the United States; shall administer laws and promulgate and enforce regulations for the promotion of safety of life and the property on and under the high seas and waters subject to the jurisdiction of the United States covering all matters not specifically delegated by law to some other executive department; shall develop, establish, maintain, and operate, with due regard to the requirements of national defense, aids to maritime navigation . . . .

7. See 33 C.F.R. § 2.05-30 (1979).


10. See 14 U.S.C.A. § 88 (Supp. 1979). According to this provision, the Coast Guard may "perform any and all acts necessary to rescue and aid persons and protect and save property." Id. § 88 (a) (1).

11. 14 U.S.C. § 89 (a) (1976) states in part:
   The Coast Guard may make inquiries, examinations, inspections, searches, seizures, and arrests upon the high seas and waters over which the United States has jurisdiction, for the prevention, detection, and suppression of violations of laws of the United States. For such purposes, commissioned, warrant, and petty officers may at any time go on board of any vessel subject to the jurisdiction, or to the operation of any law, of the United States, address inquiries to those on board, examine the ship's documents and papers, and examine, inspect, and search the vessel and use all necessary force to compel compliance . . . . If it shall appear that a breach of the laws of the United States has been committed so as to render
inspections vary in frequency and intensity according to the vessel’s classification, its history of violations, and its cargo.\textsuperscript{12} If the inspection team believes that a violation poses an unjustifiable risk to life, property, or the aquatic environment, the Coast Guard may revoke the vessel’s certificate of inspection and order it to remain in port until the violation is corrected.\textsuperscript{13} Notice is generally given to the shipowner or his agent, however, and the ship is inspected for compliance at a later date.\textsuperscript{14}

B. Hazardous Cargoes

Iron ore, limestone, bituminous coal, and grain can technically be considered BHC and account for approximately 85% of the total tonnage handled at United States Great Lakes ports;\textsuperscript{16} however, a such vessel, or the merchandise, or any part thereof, on board of, or brought into the United States by, such vessel, liable to forfeiture, or so as to render such vessel liable to a fine or penalty and if necessary to secure such fine or penalty, such vessel or such merchandise, or both, shall be seized.

The constitutionality of this section, authorizing the Coast Guard to inspect vessels for the prevention of violations of United States laws, was recently upheld. United States v. One (1) 49 Foot Sailing Vessel “Winds Will,” 405 F. Supp. 879 (S.D. Fla. 1975), aff’d, 538 F.2d 694 (5th Cir. 1976). However, it is doubtful that the Coast Guard has authority under this section to stop a vessel for any reason other than safety or documentary purposes without a showing of probable cause that a crime has been or is being committed. The Ninth Circuit recently limited the Coast Guard’s ability to stop vessels for random inspections. United States v. Piner, 608 F.2d 358 (9th Cir. 1979). Once a valid safety inspection has begun, discovery of evidence providing the necessary probable cause may allow the search to extend into areas not normally covered by the safety check. But the search may not extend beyond that reasonably necessary to determine whether the safety and documentary regulations have been complied with. When on board a vessel, the Coast Guard has no authority to interrogate or question the crew on any subject unrelated to the stopping. United States v. Warren, 550 F.2d 219 (5th Cir. 1977), cert. denied, 449 U.S. 1016 (1978). See United States v. Odneal, 565 F.2d 598 (9th Cir. 1977), cert. denied, 435 U.S. 952 (1978); United States v. Odom, 526 F.2d 339 (5th Cir. 1976).


13. A certificate of inspection may also be used as evidence in determining the “seaworthiness” of a vessel, a concept used in determining liability in marine accidents. See Valentine Waterways Corp. v. Tug Choptank, 260 F. Supp. 210, 215, aff’d, 380 F.2d 581 (4th Cir. 1967). Nearly 5,300 inspections of vessels carrying BHC are conducted each year in connection with the certification program. Hazardous Substances Report, supra note 12, at 105.

14. See Hazardous Substances Report, supra note 12, at 105. The violation is recorded and computerized. The ship is inspected again when it arrives at a United States port.

significant amount of potentially more harmful BHC is shipped on the Great Lakes. Bulk hazardous cargoes are any cargoes that present particular dangers when transported in bulk quantities on vessels, or that create unusual hazards if uncontrollably released during transfer to waterfront facilities. Although "particular" and "unusual" hazards are ambiguous terms, BHC's must exhibit one or more of the following characteristics: (1) volatile or highly reactive chemical composition; (2) unusual flammability; (3) extreme toxicity; (4) instability requiring refrigeration; or (5) cryogenic properties that may fracture normal ship or shore containers when the cargo is carried at an extremely low temperature.16

Congress recognized these dangers when it declared that "[t]he carriage by vessels of certain cargoes in bulk or in residue creates substantial hazards to life, property, [and] the navigable waters of the United States ...." 17 Nevertheless, transportation of hazardous cargoes by water is common because it is one of the least expensive modes of bulk shipment. Moreover, shipping requires less energy per ton-mile18 than any other form of transportation, and it creates minimal noise and air pollution.19

Safety, and threats to the marine environment, must also be considered in weighing the utility of waterborne transportation of BHC. Congress was cognizant of these problems in the Tank Vessel Act:20 "[E]xisting standards for the design, construction, alteration,
repair, maintenance, equipping, personnel qualification . . . must be more stringent and comprehensive for the mitigation of the hazards to life, property, and the marine environment." But little has actually been done to improve the situation.

Shipping costs are related to the age of the vessel: the older the vessel, the less its rate of transportation because of a greater likelihood that the vessel is fully amortized. There are negative incentives for vessels sporting newer, and perhaps safer equipment that has not been fully depreciated because they are subject to intense rate competition that prohibits an adequate return on capital. To correct this disincentive, the Merchant Marine Act of 1970 permits lake vessel operators to deposit earnings in tax deferred construction reserve accounts to be used in building new ships. This provision diminishes a portion of the rate competition, making newer vessels more competitive and creating needed incentives for construction of newer, safer, and more efficient lake vessels. The policy underlying this section of the Merchant Marine Act is that newer vessels will combine improved safety features with better cargo handling equipment, providing a safer and more efficient merchant fleet.

C. Vessels Equipped to Handle Bulk Hazardous Cargoes

Dry bulk carriers, self-unloaders, oceangoing vessels, and tankers (including tank barges) are the major types of bulk cargo vessels that ply the Great Lakes. The nontankers are regulated

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22. GREAT LAKES STUDY, supra note 15, at 95.
25. The most significant group in number and tonnage is the dry bulk carriers. Iron ore and grain are the principal commodities transported by these vessels. Sixty-five percent of dry bulk carriers are at least twenty years old, and nearly 46% are over forty years old. GREAT LAKES STUDY, supra note 15, at 94. Some of these ships reach lengths of 1,000 feet, thus requiring exceptional navigational skill because of their enormous size. See generally GREAT LAKES COMM'N, GREAT LAKES NEWS LETTER No. 4 at 7 (1978). Many vessels in this group are fully amortized, and therefore generate substantial profits for owners concomitant with low rates for users. GREAT LAKES STUDY, supra note 15, at 94–95.

The self-unloaders are the most efficient of the Great Lakes vessels, and are essentially smaller versions of the dry bulk carriers. GREAT LAKES STUDY, supra note 15, at 95–96. The newest self-unloaders, however, have been 1,000 foot dry bulk carriers. The first "supertanker" of this group was placed in service in 1972 (Bethlehem Steel Corporation's
under the shipping regulations applicable to cargo and miscellaneous vessels. A myriad of marine laws apply, including those relating to inspection, construction, stability, safety and fire-fighting equipment, operation of the vessel, and qualifications of its crew. Though most of the cargo of these vessels is solid, the ships may also carry a limited amount of flammable and combustible liquid cargo in bulk if the part of the vessel carrying such cargo satisfies the tank vessel requirements of the shipping regulations. Bulk shipment of solids requires a special permit if the cargo is determined dangerous. The regulations provide

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Stewart J. Cort, Great Lakes News Letter, supra at 5, and hauled 2,100,000 net tons of iron ore that year. Great Lakes Study, supra note 15, at 96. They are efficient because they are fitted with their own unloading system—hence the term "self-unloader." The ill-fated Edmund Fitzgerald, which sank in Lake Superior on November 10, 1975, was a 729 foot self-unloader completed in 1958. See Great Lakes News Letter, supra, at 5. Seventy-three of these vessels ply the Great Lakes, carrying mostly coal and limestone, and requiring only a brief stay in port. Great Lakes Study, supra note 15, at 95-96. As an example of the efficiency of these vessels, the Stewart J. Cort, supra, can load or unload iron ore at a rate of 10,000 net tons per hour. Id. at 96.

The oceangoing fleet comprises approximately twenty-five bulk carriers and 271 conventional oceangoing general cargo vessels. Id. The bulk carriers have all been built within the past fifteen years and usually carry dry bulk cargo such as grain, general cargo such as steel, and some containerized cargo. Maximum use is obtained from the conventional vessels in the oceangoing fleet through the carriage of general and containerized cargo. Id.

The future of the domestic, non-oceangoing dry bulk fleet is in larger ships having two or more times the carrying capacity of the vessels which they replace. These vessels will be faster and better suited to winter navigation. Id. at 99. This improvement in vessel efficiency, coupled with improved loading and discharging facilities, will allow replacement vessels to carry more cargo faster, and for a greater portion of the year, than vessels currently in service. The cumulative effect of these changes will probably be a fleet that is fewer in number and more structurally sound than at present. The replacement of the overseas fleet, on the other hand, is predicted to occur at a faster rate in the immediate future. Id. at 100. Much of this fleet is in need of replacement, id., thus providing an excellent opportunity for the construction of vessels with design features harmonious with present trade requirements and safety standards.

28. Masters, mates, engineers, pilots, and staff officers must pass written and medical exams. Seamen and tankermen are required to pass medical exams, and tankermen, in addition, must present evidence that they are "trained in, and capable of performing efficiently the necessary operations on tank vessels which relate to the handling of cargo." 46 C.F.R. § 12.20-1 (1979).
29. Permission to carry such cargo is granted by means of an endorsement on the vessel's certification of inspection. 46 C.F.R. § 90.05-35 (1978).
31. A special permit is granted only after evidence of competent cargo handling experience is furnished to the Coast Guard. 46 C.F.R. § 148.01-11 (b) (2) (1978). Solid hazardous materials are listed in § 148.01-7. Unlisted cargoes of this type are regulated under
for the National Cargo Bureau to assist the Coast Guard in inspecting vessels for suitability to load such materials in bulk, in examining stowage and recommending stowage requirements, and in issuing certificates of loading. Additionally, nontankers must have shipping papers and dangerous cargo manifests. Neither the hazards nor the regulation of BHC end here; in fact, the danger to life and property is greater when the vessel is in port.

D. Waterfront Facilities Designed to Handle Bulk Hazardous Cargo

"Designated waterfront facilities" are specified by the Commandant of the Coast Guard for the handling, storage, loading, and unloading of explosives, flammable and combustible bulk

§ 148.01-9 and require a special petition to be filed with the Coast Guard. The petition must contain a detailed description of the hazardous material, justification for its shipment and the proposed method of handling. These cargoes are more like hazardous materials covered by Title 49 of the C.F.R. (Dep't of Transportation "package regulations") than the BHC's that are within the scope of this article.

32. National Cargo Bureau certificates of loading are accepted as "evidence of compliance with the applicable provisions of this Part." 46 C.F.R. § 148.01-13 (1978).

33. 46 C.F.R. §§ 148.02-1, 148.02-3 (1978). Shipping papers must include the hazard class of the cargo, quantity of cargo carried, name and address of the U.S. Shipper, and signed certification that the cargo is properly named, prepared, and in proper condition for bulk shipment in accordance with applicable regulations. The dangerous cargo manifest must include the name and nationality of the vessel, the type and quantity of hazardous material carried, and the holds in which the cargo is stored. Id.

34. The term "waterfront facility" when used in this part "means all piers, wharves, docks, and similar structures to which vessels may be secured; areas of land, water, or land and water under and in immediate proximity to them; buildings on such structures or contiguous to them and equipment and materials on such structures or in such buildings." 33 C.F.R. §§ 126.01, 6.01-4 (1979). Proposed rules would add to this definition refineries, tank farms, and warehouses. In addition, the definition would be expanded to include federal, state, municipal, and private facilities. 43 Fed. Reg. 15,107, 15,111 (1978). Note that 33 C.F.R. § 126.01 (a) excludes from the § 6.01-4 definition of "waterfront facility" those facilities directly operated by the Department of Defense. Whether this would be changed by the proposed definition, including "federal facilities," is unclear. For a general discussion of waterfront facilities and bulk cargo handling, see R. ORMAN, CARGO HANDLING AND THE MODERN PORT 118-38 (1965).

35. The Commandant of the Coast Guard is appointed by the President, with the advise and consent of the Senate, for a period of four years. 14 U.S.C. § 44 (1976).

36. 33 C.F.R. § 126.09 (1979) refers to explosives as "designated dangerous cargo." Permits are required for the handling of this cargo and are required "for each transaction of handling, loading, discharging, or transporting designated dangerous cargo." Id. § 126.19 (a). See id. § 6.12-3. Transfers are strictly supervised. §§ 126.19, 126.21, and permits may be terminated under § 126.23 or penalties may be imposed under § 126.25. Explosives in this sense are not bulk hazardous cargoes and as such are beyond the scope of this article; however, the extreme hazard posed by them is worthy of note.

37. A flammable liquid is "any liquid having a flash point below 100°F, (37.8°C)." 49 C.F.R. § 173.115 (a) (1978). "Flash point" means the minimum temperature at which
liquids, and other hazardous cargoes. The Commandant may authorize "facilities of a particular hazard" to handle vessels laden with certain enumerated dangerous cargoes. In either case, these facilities must meet requirements in addition to those applicable to other facilities, including posting guards, maintaining firefighting equipment, and adhering to specific fire safety measures. The Coast Guard has recognized, however, that "[p]resent regulations have not kept abreast of changing technologies and industry practices." Rules have been proposed requiring the facility operator to provide an operations manual to the Captain of the Port delineating operating requirements and procedures, specifying duties and responsibilities of personnel, and describing the facility and its emergency systems. Presumably, under this system the facility operator and the Captain of the Port would be able to respond efficiently and effectively to an emergency. Emergency plans could be developed in advance to provide guidance during "anticipated" disasters. In response to the largely outdated regulations for waterfront facilities handling BHC, the proposed rules are intended to regulate the design, construction, and equipment in a manner consistent with the use of the facility. The rules finally adopted should either be flexible enough to accommodate changes in marine technology (for example, new vessel design,

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38. A combustible liquid is "any liquid that . . . has a flash point at or above 100°F (37.8°C) and below 200°F (93.3°C) except any mixture having one component or more with a flash point at 200°F or higher that makes up at least 99% of the total volume of the mixture." 49 C.F.R. § 173.115 (b) (1978).


40. "Facility of a particular hazard" is defined as "a designated waterfront facility which is authorized to handle in bulk quantities any of the commodities listed in § 124.14 (b) or any commodity for which a permit or written permission is required by 46 C.F.R. 146.29-100; 49 C.F.R. 176.100; or 49 C.F.R. 176.415." 33 C.F.R. § 126.05 (b) (1979).


44. "'Captain of the Port' . . . means the officer of the Coast Guard, under the Command of a District Commander, so designated by the Commandant for the purpose of giving immediate direction to Coast Guard law enforcement activities within his assigned area." 33 C.F.R. §§ 126.01, 6.01-3 (1979). See 42 Fed. Reg. 48,021 (1977).

45. This proposal may be compared with plans for the handling of LNG. See U.S. COAST GUARD, DEPT' OF TRANSPORTATION, PORT OF BOSTON LNG-LPG OPERATIONS/EMERGENCY PLAN (1977). Cf. 33 C.F.R. § 154.300 (1979) (operations manual similar to the one proposed here).

new handling equipment, or new types of cargo), or should be periodically updated to ensure that safety considerations are attuned to new developments. The latter is perhaps more effective because regulations that are too flexible may also tend to be too general, and may not provide sufficient guidance for safe transfer or cargo loading or unloading operations. Periodic updating, moreover, would necessitate constant monitoring of recent developments; while it may entail more work, it will assure that the most recent developments are included in the regulations.

Preparedness is a key element in a successful loading, unloading or transfer, and notification of the departure and arrival of vessels carrying BHC is necessary for such preparation.\textsuperscript{47} Under present regulations, the master, agent, or person in charge of a vessel bound for a United States port, and carrying BHC considered to pose a particular hazard, must notify the cognizant Captain of the Port twenty-four hours in advance of arrival.\textsuperscript{48} The present regulations are limited to foreign and United States vessels (other than pleasure or fishing craft)\textsuperscript{49} that have traversed the "high seas" prior to arrival in port.\textsuperscript{50} Proposed regulations would remove the high seas limitation, and extend notification requirements to departures as well as arrivals.\textsuperscript{51} In addition, the BHC's covered by the proposed regulations would be expanded to include those subject to two subchapters of the shipping regulations.\textsuperscript{52} Apparently, the rationale for the proposal is that present

\textsuperscript{47} Notification processing, which takes approximately thirty minutes, involves a log entry, a check on the vessel's history, the recognition of unusual conditions, and the determination of any necessary action. Advance notice of arrival is required where unusual conditions that place a vessel's safety in jeopardy exist, \textit{e.g.}, fire or structural damage, regardless of the nature of the cargo carried. 33 C.F.R. § 124.16 (1979).

\textsuperscript{48} \textit{Id.} § 124.14 (1979).

\textsuperscript{49} \textit{Id.} § 124.20 (1979). The penalties are stiff; however, they may be necessary to ensure compliance by foreign vessels which may, in addition to posing health and safety threats, pose a threat to national security.

\textsuperscript{50} "High seas" may be defined as that area beyond the low water mark along the coast, or beyond the waters within the headlands of the United States. 33 C.F.R. § 124.10 (a) (4) (1979).

\textsuperscript{51} 43 Fed. Reg. 25,957, 25,959 (1978). The proposal would transfer this regulation to Part 161 of 33 C.F.R. and modify it to perform safety as well as security functions. The purpose of the revision is to relieve the situation where Coast Guard Captains of the Port receive inadequate information concerning vessel movements within their respective areas. See 33 C.F.R. Part 6 (1979). Under the proposed regulations, foreign vessels preparing to enter the Great Lakes will have to give notice at least twenty-four hours in advance of arrival at the Snell Locks in Massena, New York.

regulations are inadequate to fully protect life, property, and the marine environment from the dangers of BHC.

II. LIQUID BULK HAZARDOUS CARGO

A. Introduction

The regulation of flammable and combustible bulk liquids\(^5\)\(^3\)\(^3\) cargoes that are primarily carried aboard tank vessels\(^5\)\(^4\) and loaded or unloaded at specially equipped terminals—is intended to promote safe, pollution-free, and efficient movement of the cargo. This objective is difficult to achieve because recently the number of liquid bulk hazardous cargoes (LBHC's) transported by water has increased dramatically,\(^6\)\(^5\) while at the same time, tank vessels have increased in size and complexity.\(^5\)\(^6\) The possibility of catastrophic accidents is omnipresent. In fact, certain chemicals are so new that their reactive properties have not been fully ascertained.\(^5\)\(^7\)

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53. For a thorough examination of the regulation of one particular bulk hazardous liquid, see Doniger, Federal Regulation of Vinyl Chloride: A Short Course in the Law and Policy of Toxic Substances Control, 7 Ecology L. Q. 497 (1978).

54. These include barges as well as self-propelled vessels. Tank barges, like other barges, may have one or more crew members berthed on board, in which case they are considered manned. When a crewmember is present only for the handling of cargo, it is considered unmanned. At times, the difference is significant in determining which regulations are applicable.

55. Over 500 varieties of flammable and combustible liquids, liquified gases and other bulk hazardous liquids are presently transported by water. U.S. Coast Guard, Dep't of Transportation, A Manual for the Safe Handling of Flammable and Combustible Liquids and Other Hazardous Products (CG-174) at xxi (1976) [hereinafter cited as FLAMMABLE AND COMBUSTIBLE LIQUIDS MANUAL].

56. The increase, however, has been more profound for oceangoing tank vessels than for domestic tankers. See Great Lakes Study, supra note 15, at 100.

57. See Great Lakes Basin Comm'n Standing Comm. on Transportation, Transportation of Hazardous Materials in the Great Lakes Region: Recommendations for the Future at iv, 7 (1978). The Coast Guard has developed a Chemical Hazards Response Information System (CHRIS) to provide "timely information essential for proper decision making by responsible Coast Guard personnel and others during emergencies involving the water transport of hazardous chemicals." U.S. Coast Guard, Dep't of Transportation, A Condensed Guide to Chemical Hazards (CG--446--1) (Letter of Promulgation by W. M. Benkert, Chief, Office of Marine Environment and Systems). CHRIS consists of three other publications by the Coast Guard: Hazardous Chemical Data (CG--446--2); Hazard Assessment Handbook (CG--446--5); and Response Methods Handbook (CG--446--4). See also U.S. Coast Guard, Dep't of Transportation, A Feasibility Study of Response Techniques for Discharges of Hazardous Chemicals That Sink (CG--D--56--78) (1978); U.S. Coast Guard, Dep't of Transportation, Chemical Hazards Response Information System for Multimodal Accidents (CHRISMA) (CG--D--148--75) (1978); and Nat'l Academy of Sciences, System for Evaluation of the Hazards of Bulk Water Transportation of Industrial Chemicals (1974). An effective response to an accident, however, depends on the degree to which the properties of the spilled chemical are known.
The applicable marine laws are designed to ensure the safe storage, handling, transfer, and transport of LBHC. Possible hazards stem from fire, explosion, threat to the aquatic environment, danger of an adverse chemical reaction with water, air, or other hazardous substances or containment materials, and various dangers to health. Chemicals coming into contact with the skin may cause severe irritations, burns, or destruction of tissue, or may even be absorbed into the body's system. Vapors from some chemicals, if inhaled, may cause dizziness, unconsciousness, or even death. In addition, the vapors from flammable and combustible liquids are heavier than air and may flow across the decks of vessels, docks, the water surface, or the ground. The flammable vapors could travel to an ignition source and flash back to the vessel. To prevent a dangerous buildup of vapor pressure, the vapors must be vented to the atmosphere in safe quantities and in areas removed from sources of ignition.

In an effort to fashion appropriate regulations to reduce these dangers, flammable liquids are divided into three categories on the basis of their degree of hazard. Similarly, combustible liquids are divided into two categories. The requirements for vessel design, operation, and crew certification are all dependent upon the grade of the cargo—determined according to the degree of the hazard—the vessel is capable of handling.

B. Handling of Liquid Bulk Hazardous Cargo

Theoretically, tankships are designed to prevent mishaps, but when accidents occur, to keep damage to life, property, and the marine environment to a minimum. To achieve this end, all tanker

58. For purposes of CHRIS, supra note 57, the Coast Guard rates relative hazards in each category from 0 to 4; with 0 posing no hazard and 4 the greatest hazard. The major categories are fire; health (including such qualities as vapor irritants, liquid or solid irritants, and poisons); water pollution (taking into consideration human toxicity, aquatic toxicity and aesthetic effects); and reactivity (with other chemicals, water and air). U.S. COAST GUARD, DEP'T OF TRANSPORTATION, CHRIS HAZARDOUS CHEMICAL DATA 3-11, 12 (CG-446-2) (1974).

59. The categories range from the most flammable "A" to the least flammable "C". Categories are based on flash point, see note 37 supra, and Reid Vapor Pressure, measured by placing a small amount of liquid in a closed container which is then heated to 100°F. The pressure within the closed container is then measured at that temperature.

60. The categories, "D" and "E," are based on flash point only. See note 37 supra. The flash point of category "D" (more combustible) is between 80°F and 150°F, and the flash point of category "E" (less combustible), is 150° or above.
hulls are divided into cargo tanks by longitudinal and transverse bulkheads. Precautions are taken to remove sources of ignition from the cargo tanks: the tanks are strategically located; attempts are made to prevent the accumulation of explosive vapors; and fireproof decks and bulkheads are used. The extent of the precaution is proportional to the degree of hazard. Accordingly, tankers that carry corrosive liquids under pressure are subject to more stringent requirements than those carrying the five grades of hazardous bulk liquids.

Tank barges, common on inland waterways and usually carrying petroleum products, haul much of the Great Lakes LBHC. All of the bulkheads are oiltight and each barge is divided into several separate cargo tanks. In addition, each tank is equipped with piping and venting systems, and an access hatch. The end spaces on barges are left empty in order to provide buoyancy when the cargo tanks are full. The shipment of LBHC by barge plays an integral role in the network of hazardous cargo shipments in the United States. Alternate modes of transportation—rail, truck, and pipeline—lack the capacity to handle the quantity of LBHC presently shipped by barge.

When hazardous cargo is handled aboard tank vessels, care must be taken to avoid the mixing of incompatible liquids. More cargo contamination results from human error than from leaking bulkheads or other structural faults. An improper mixture of cargo may result in a fire, explosion, rapid boiling, release of toxic vapors, or an immediate increase in corrosive action. The danger remains even after the contaminated cargo has been delivered for ultimate consumption. For example, if a home heating oil's flash point is lowered by its mixture with gasoline, there may be no harm aboard ship, but the mixture may later cause a home heating furnace to explode. To avoid these potentially dangerous

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62. See notes 59 & 60 supra.
63. See note 54 supra.
64. See HAZARDOUS SUBSTANCES REPORT, supra note 12, at 114.
65. Many barge shipments are in the form of integrated tows. “Tows” are common, and range in size from an “express tow” of four barges connected end to end, to a “giant tow” comprising twenty to forty barges joined in formation. FLAMMABLE AND COMBUSTIBLE LIQUIDS Manual, supra note 55, at 2–3–7.
situations, and to prevent tank errors, pumping system irregularities, and pipeline valve leaks, personnel must be adequately trained and alert during cargo transfer operations and the equipment must be maintained in proper working order.  

Flammable and combustible bulk liquids, especially petroleum, may create problems in transfer. When the liquid is moving through cargo hoses, static electrical charges may accumulate and discharge in the form of sparks. These sparks, in turn, may ignite vapor mixtures that are within their explosive ranges. Oil that is splashed or sprayed may become electrostatically charged and create the same hazard. The danger is particularly acute when the cargo is loaded directly through an open-ended hose or a loading arm inserted into a tank through a deck opening. Unless a safe loading rate is used, this loading system may create a charged mist or spray in the presence of flammable vapors, a combination that presents a considerable risk of explosion.

If a fire occurs, the person in charge of the transfer operation on deck must be contacted and all transfer operations shut down. To stop the flow of petroleum in an emergency, the vessel must be equipped with emergency pump controls or quick-acting power-activated valves that can be operated from the cargo handling area on deck, or from another operating station. The fire-fighting system aboard tankers consists of permanent piping that takes water from beneath the vessel and transmits it to fire hydrants located on board. Foam systems, however, are the most effective means of fighting petroleum fires. To avoid rekindling “extinguished” fires of this sort, a barrier of foam, steam, or water fog must be maintained.

68. During cargo transfer, a qualified person in charge must be on the vessel and another must be on the dock at all times. On tankships, the supervisor must be a licensed officer, while on tank barges, a licensed officer or certified tankerman fulfills the requirements. Flammable and Combustible Liquids Manual, supra note 55, at 3–30. In addition, a declaration of inspection must be checked and signed at each watch or shift change by the new person in charge. Id. at 3–11. See 33 C.F.R. § 156.150 (1979) (a declaration of inspection is a necessary prerequisite to any oil transfer operation).


70. Older vessels generally use a “chemical” foam which is not as effective as the “mechanical” foam used on most newer vessels. U.S. Coast Guard, Dep’t of Transportation, Fire Fighting Manual for Tank Vessels 12–17 (1974) [hereinafter cited as Fire Fighting Manual]. The fire fighting system on the oldest tankers is the steam smothering system. While not as efficient as either of the foam systems, it is still effective in combating petroleum fires, provided there is no access for air near the burning surface of the cargo. The steam smotherer reforms in enclosed or confined spaces, and tends to isolate the fire from the supply of oxygen. It also cools the fire to some extent, and dilutes the vapor/air mixture until it is too lean to explode. Id. at 24.
between the liquid's surface and the radiating heat. After a conflagration, the Coast Guard investigates the fire's cause and plans future preventive action.

Other hazards exist because certain liquids are self-reactive and may react violently when exposed to air. An inhibitor may be added to slow down or prevent such reactions. This procedure is ineffective, however, to prevent an explosion of the vapor in the ullage space, and therefore "inerting" may be required. Inerting is a process achieved by displacing the oxygen from the ullage space and replacing it with a blanket of inert gas—a gas that will not support combustion and will not react with the cargo.

When the vessel's cargo tanks are not gas-free, the vessel must be under constant surveillance. Often, cargo tanks are not gas-free after unloading because they contain flammable vapors that must be vented from the tanks as the ballast is loaded. Although fires in cargo tanks are rare, in mid-December 1976 the Sansinena, an 810-foot Liberian tanker built in 1958 without an inert gas system, suffered an explosion in its cargo tanks because of a high concentration of gas. The vessel went down in a harbor at San Pedro, California, costing many lives and causing extensive property damage.

It has been asserted that the accident would not have occurred had the ship been fitted with an inert gas system. Presently, all tankships of 100,000 deadweight tons or more must

71. Id. at 17.
72. See FLAMMABLE AND COMBUSTIBLE LIQUIDS MANUAL, supra note 55, at 1–15.
73. Those cargoes containing an inhibitor must be carried on vessels that have cargo sampling equipment, thus enabling personnel to check the inhibitor concentration, as some inhibitors tend to deteriorate with age. Therefore, the vessel must have an adequate supply of the inhibitor and a means of introducing and circulating it into the cargo while the vessel is underway.
74. The ullage space is the empty area in the cargo tank between the cargo and the top of the tank.
75. Nitrogen is the gas most often used for this purpose.
76. FLAMMABLE AND COMBUSTIBLE LIQUIDS MANUAL, supra note 55, at 3–18.
77. Ballasting is the taking on of water into certain tanks in order to maintain the stability and maneuverability of a vessel.
78. FIRE FIGHTING MANUAL, supra note 70, at 41. See also Recent Tanker Accidents: Hearings on Legislation for Improved Tanker Safety Before the Senate Comm. on Commerce, Science and Transportation, 95th Cong., 1st Sess. 428 (1977) [hereinafter cited as Recent Tanker Accidents].
79. See text accompanying note 75, supra.
80. Recent Tanker Accidents, supra note 78, at 42–43.
81. Id. at 5 (statement of Sen. Stevens); id. at 7 (Statement of Sen. Hollings); id. at 395, 480. See also U.S. COAST GUARD, DEP'T OF TRANSPORTATION, PROCEEDINGS OF THE MARINE SAFETY COUNCIL No. 3 (CG—129) (1978).
be fitted with an inert gas system if they have a "keel laying date" on or after January 1, 1975. The inert gas system requirement is representative of a prospective regulation, applying to only those vessels constructed after a certain date because of the determination that it is neither practical nor economically feasible to require vessels currently in service to install such equipment.

Although current regulations for waterfront facilities are more general than specific, more detailed regulations apply to hazardous bulk liquid and liquified gas cargo transfer systems and operations, probably because of the extreme hazard. The following requirements apply to these facilities: (1) the cargo transfer system must be under surveillance by, and in continuous control of, the waterfront facility owner or operator; (2) the person in charge must be trained in these operations, competent, and able to furnish to the Captain of the Port documentary evidence to this effect; and (3) warning signs, secure transfer systems, cargo information cards identifying the cargo and emergency procedures, and the testing of operating and emergency equipment must be employed. Thereafter, the designated dangerous cargo may be handled, loaded, discharged, or transported at any designated waterfront facility only if a permit for such operation has been issued by the Captain of the Port. A general permit, however, may be issued for handling, storing, stowing, loading, discharging, or transporting other LBHC's not enumerated in the Code. The primary concerns of safety and pollution prevention seem, therefore, to apply to vessels docked at waterfront facilities, as well as vessels en route.

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82. 46 C.F.R. § 32.53 (1978). Tankships carrying only grade "E" bulk liquid cargo, see note 60 supra, are exempted as well as those carrying only liquified gas cargo. Proposed rules would extend the coverage of this section to tankships of 20,000 DWT or more. 42 Fed. Reg. 24,874, 24,876 (1977). The 100,000 DWT figure was chosen initially because of the explosion of three very large crude carriers (generally 200,000 DWT or more) in 1969 after washing their tanks. Recent Tanker Accidents, supra note 78, at 428. The regulation was promulgated on Jan. 26, 1976 in spite of an explosion within a breached cargo tank of the 54,000 DWT Liberian crude carrier Corinthos on Jan. 31, 1975, one year earlier. The tanker sank while moored at a dock at Marcus Hook, Pa. Twenty-six persons were killed as a result of the accident. See 42 Fed. Reg. 24,874, 24,875 (1977).


84. 33 C.F.R. § 126.19 (1979). Permits are required for each transaction, thereby alerting the Captain of the Port to each transfer operation which may endanger persons or property.

85. 33 C.F.R. § 126.27 (1979). Issuance of this permit is conditioned upon the fulfillment of the safety requirements in § 126.15. See text accompanying note 41, supra. For this "non-designated dangerous cargo," a permit is not required for each transaction.
III. Pollution Problems Related to Bulk Hazardous Cargo

Approximately 10,000 discharges of oil and hazardous substances occur each year in United States navigable waters.86 A discharge is defined as any spilling, leaking, pumping, or dumping of a substance into the water, either purposefully or by accident.87 Although major discharges from catastrophic accidents attract much public attention,88 approximately 85% of oil discharges are from the routine washing of dirty ballast at sea.89 Most crude oil tankers use the “load on top” system to reduce the amount of oil that is discharged. The oil/water mixture in cargo tanks is separated and the water is pumped overboard. The “cargo dregs,” or oily residues, are retained on board and the next cargo is loaded on top of them. The load on top system was the oil shipping industry’s response to unnecessary cargo tank washings at sea, and was intended to reduce pollution and wasteful oil discharges.90 The assumption behind this system appears to be that beyond a certain distance at sea it is safe, or at least justifiable, to dump wastes, and that these discharges create only a negligible amount of pollution. These assumptions have been challenged by critics who believe that other means of controlling this type of pollution are more effective.91 One method is to decrease the number of tanks ballasted while underway; another involves the construction of segregated ballast tanks. While concededly more effective in reducing pollution, these procedures are more elaborate and expensive; hence, the industry is reluctant to use them.

88. In mid-December 1976, the Argo Merchant, a 644.5 foot Liberian tanker built in Germany in 1953, ran aground approximately twenty-eight miles southeast of Nantucket Island, Mass. spilling several million gallons of fuel oil. The Argo Merchant catastrophe was allegedly caused by the negligence of the crew and by faulty navigational equipment. See Recent Tanker Accidents, supra note 78, at 40–42, 46–54. Shortly after this incident, a rash of other mishaps occurred: the spilling of 133,000 gallons of crude oil into the Delaware River by the Olympic Games on Dec. 27, 1976 because of equipment failure and miscalculation by the pilot, id. at 43–44; the grounding of the Daphne at Guayanilla, P.R. on Dec. 28, 1976, id. at 44–45; the grounding of the Universe Leader in the Delaware River on Jan. 4, 1977, id. at 45–46, and the leaking of 5,000 gallons of fuel oil by the Oswego Peace at New London, Conn. on Dec. 24, 1976, id. at 45.
90. See Pritchard, Load on Top—From the Sublime to the Absurd, 9 J. MAR. L. & Com. 189, 185–86 (1978).
91. Id.
The ballasting controversy has been litigated in court. In *Natural Resources Defense Council v. Coleman*, plaintiffs sued under 46 U.S.C. § 391a (7) to force the Coast Guard to enact within a certain period of time regulations governing the design, construction, alteration, and repair of United States flag vessels. Before the disposition of the case, defendants promulgated several regulations on the subject. The plaintiffs complained about one of these regulations in particular, which provided that “[t]he distribution of the segregated ballast spaces within the cargo tank area must be acceptable to the Coast Guard.” The Council argued that this section was not specific enough and that the Coast Guard should enact the regulation according to a time schedule. The United States District Court for the District of Columbia held that the existing regulation adequately fulfilled the defendant’s duty and that a more specific regulation was not required. Judge Sirica’s opinion relied on a portion of 46 U.S.C. § 391a (7) to show that the rules and regulations “shall, to the extent possible, include but not be limited to standards to . . . reduce cargo loss following collision, grounding, or other accident, and to reduce damage to the marine environment by normal vessel operations such as ballasting and deballasting, cargo handling, and other activities.” The Coast Guard’s legal duty, therefore, was only “to write the best possible regulation on the subject of the allocation of segregated ballast space.” The court thus deferred to the Coast Guard’s “expertise” and refrained from imposing a timetable for compliance with their duty.

In the Federal Water Pollution Control Act Amendments of 1972, Congress declared “that there should be no discharges of oil or hazardous substances into or upon the navigable waters of the United States, adjoining shorelines, or into or upon the waters of the contiguous zone.” The Act called for the promulgation of rules and regulations by the Administrator of the Environmental Protection Agency (EPA) for substances that present an imminent and substantial danger to the public health or welfare.

94. 411 F. Supp. at 450.
95. Id.
97. Id. § 311 (b) (1).
98. Id. § 311 (b) (2) (A).
Rules were finally established for the designation of hazardous substances on March 13, 1978. The EPA published a list of 271 hazardous substances, the regulation of which became applicable to vessels on September 11, 1978. Fines are assessed per discharge according to the toxicity, degradability, and dispersal characteristics of discharged substances and cleanup costs may be assessed against the offender. Onshore and offshore facility operators, as well as owners and operators of vessels, are subject to the Act. A dilemma exists in enforcement, however, since small discharges usually go unnoticed and massive discharges are difficult to effectively clean up. The impact of this dilemma may be lessened if the fear of penalties and liability for cleanup causes owners and operators to intensify their precautionary efforts.

IV. Bulk Hazardous Cargo Aboard Foreign Vessels

An increasing amount of BHC is shipped aboard foreign vessels and the overwhelming percentage of oil transported by ship is aboard foreign tankers. Recognizing this situation, the Coast Guard has developed a Letter of Compliance Program, which imposes United States safety standards on foreign vessels navigating in United States waters. The variety and volume of LBHC's shipped on foreign vessels has prompted the Coast Guard to de-
termine that foreign ships present an unacceptable level of risk to United States ports and territorial waters.¹⁰⁶

Until satisfactory international standards of construction and maintenance are adopted, the United States will rely on special interim regulations to ensure minimum safety precautions by all vessels carrying hazardous cargoes through American territorial waters. These regulations prescribe procedures for issuance of a letter of compliance to foreign vessels carrying LBHC's that present unusual operating risks to life and property in United States ports and waterways.¹⁰⁷ The risks may be attributed to vessel design, types of cargo carried, methods of handling the cargo, or unconventional shipboard systems. The following are closely examined by the Coast Guard before it issues a letter of compliance: (1) design and arrangement of cargo tanks, cargo piping, and venting systems; (2) arrangement and adequacy of the fire extinguishing system and fire-fighting equipment; (3) safety devices and related systems that warn of leaks or other disorders that could result in dangerous accidents; (4) isolation of toxic cargoes; (5) compatibility of one cargo with another and with the materials of the containment system; and (6) adequacy of the electrical equipment installed in potentially hazardous areas.¹⁰⁸

Many considerations embracing all aspects of the mode of transportation are necessary to ensure the safe movement of BHC. Important ones are the intended routes, navigational plans, vessel design features, methods of cargo handling, and the available shore facilities. The same standards are used for foreign vessels as for United States vessels in determining whether a certain commodity creates an unusual hazard.¹⁰⁹

Foreign vessels carrying dangerous cargoes must submit a request to the Commandant for review of the cargo containment system. The request must include: (1) nation of vessel registry; (2) a list of all cargoes to be carried that present a potential unusual operating risk; (3) anticipated routes of the vessel; (4) classification society; and (5) a description of the cargo containment

¹⁰⁶. Id.
¹⁰⁸. Foreign vessels subject to inspection at United States ports are those which have novel design or construction features not addressed by the Convention for the Safety of Life at Sea or those which may present unusual operating risks. 46 C.F.R. § 2.01-15 (1979).
¹⁰⁹. See text accompanying note 16 supra.
system. For existing vessels, required information must be submitted at least ninety days before entry into United States ports.\(^{110}\) New vessels or recently converted ones must be allowed sufficient time for review, comment, and any necessary revisions to ensure compliance with Coast Guard requirements prior to their initial entry into our ports. In lieu of submitting plans and drawings of the cargo vessel, owners of vessels complying with the Intergovernmental Maritime Consultative Organization (IMCO) Code for Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk may submit certification of compliance from their national administration. Generally, a new vessel built in compliance with the IMCO Code will not require plan review. A vessel that only partially meets the requirements of the IMCO Code, however, must be subject to additional plan review. Although it is willing to review plans for foreign ships, the Coast Guard does not conduct examinations in foreign shipyards to issue letters of compliance. When plan review has been completed for a vessel, and the plan approved, the owner or his agent must notify the Commandant and the cognizant Captain of the Port or Marine Inspection Officer of the date and place of initial arrival in port. Notification must be given at least two weeks prior to arrival. The vessel is then boarded and inspected by representatives of the Captain of the Port and Marine Inspection Officer. Re-examinations of such vessels are conducted bieinially.

The Coast Guard has no direct control over the qualifications of foreign crewmembers; it therefore simply recommends that vessels be operated in accordance with internationally accepted operating standards. Cargo, however, must be loaded and discharged according to the same regulations applicable to United States vessels, and in addition, a "loading diagram" indicating the cargoes to be carried, loaded, or discharged must be available to the Captain of the Port.

These special interim regulations, and the institution of the Letter of Compliance Program are recent developments in the regulation of BHC. Before 1965, the carriage of dangerous cargo by water was infrequent, and foreign vessels were allowed entry into United States ports without regard for the threat to safety and national security posed by these vessels.\(^{111}\) The growth of the

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\(^{111}\) Id.
chemical industry and chemical shipments by water, however, increased awareness of the serious risks posed to the ports and waterways of the United States by the carriage of certain hazardous cargoes.

CONCLUSION

It seems but a truism to say that the regulation of a BHC should be in proportion to the danger it poses to life, property, and the marine environment. Yet at times it is not. The optimal transportation scheme lies within the delicate balance of an elaborate regulatory system on one hand and an efficient and practical one on the other. The former system illustrates the problems of cumbersome "overregulation," while the latter may be too elastic to accomplish its goals to any significant degree. Determination of the extent of "proper regulation," therefore, must consider the hazard of the cargo, the threat posed, and the total cost involved. This calls for an individual evaluation of each commodity and the circumstances surrounding its transport. It also entails a policy judgment regarding the need for shipping the cargo.

The Coast Guard must be a sounding board, as well as a principal, in the formulation of regulations. Challenges to proposed regulations are heard at public hearings and challenges to existing ones are made through the administrative or formal adjudicative processes. The agency must be sensitive to the needs of carriers, environmentalists, manufacturers, and consumers. A definite formula is difficult and perhaps unwise to articulate. However, "the best possible regulation" may be produced through an accounting of the needs and circumstances that can practically be taken into consideration.112

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112. On October 18–19, 1978, a seminar on the Great Lakes transportation of hazardous materials was held in Chicago, Illinois. Sponsored by the Great Lakes Basin Commission Standing Committee on Transportation, the report on the seminar concluded that "regulations and policies surrounding the transportation of hazardous materials [are] too large and complex." GREAT LAKES BASIN COMM'N STANDING COMM. ON TRANSPORTATION, TRANSPORTATION OF HAZARDOUS MATERIALS IN THE GREAT LAKES REGION: RECOMMENDATIONS FOR THE FUTURE at iv (1978). The report cited problems regarding inadequate data on the "amounts, types, routes, and transfer points of hazardous materials moved, and risks associated with their movement." Id. It recommended a simplification of the regulations with a clear delineation of responsibilities and jurisdictions. Also suggested were better collection of data on cargo and its transport routes, as well as the maintenance of easily accessible records to improve enforcement, incident management, and contingency plans. Id. at iv–vi.